Role of Artificial Intelligence Applications in Real-Life Clinical Practice: Systematic Review

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Abstract

BACKGROUND
Artificial intelligence (AI) applications are growing at an unprecedented pace in health care, including disease diagnosis, triage or screening, risk analysis, surgical operations, and so forth. Despite a great deal of research in the development and validation of health care AI, only few applications have been actually implemented at the frontlines of clinical practice.
OBJECTIVE
The objective of this study was to systematically review AI applications that have been implemented in real-life clinical practice.
METHODS
We conducted a literature search in PubMed, Embase, Cochrane Central, and CINAHL to identify relevant articles published between January 2010 and May 2020. We also hand searched premier computer science journals and conferences as well as registered clinical trials. Studies were included if they reported AI applications that had been implemented in real-world clinical settings.
RESULTS
We identified 51 relevant studies that reported the implementation and evaluation of AI applications in clinical practice, of which 13 adopted a randomized controlled trial design and eight adopted an experimental design. The AI applications targeted various clinical tasks, such as screening or triage (n=16), disease diagnosis (n=16), risk analysis (n=14), and treatment (n=7). The most commonly addressed diseases and conditions were sepsis (n=6), breast cancer (n=5), diabetic retinopathy (n=4), and polyp and adenoma (n=4). Regarding the evaluation outcomes, we found that 26 studies examined the performance of AI applications in clinical settings, 33 studies examined the effect of AI applications on clinician outcomes, 14 studies examined the effect on patient outcomes, and one study examined the economic impact associated with AI implementation.
CONCLUSIONS
This review indicates that research on the clinical implementation of AI applications is still at an early stage despite the great potential. More research needs to assess the benefits and challenges associated with clinical AI applications through a more rigorous methodology.